machine spread, maximum number of machines that can be assigned to one operator, and the maximum utilization of all operators, is also entered.

For example, the department under consideration is department number 1300. The maximum distance of machines assigned to one operator is eight machines apart, and the maximum utilization of operators is 100 percent. The information regarding the schedules are also displayed on a computer screen. For example, operator number 9 will be assigned to machine number 2, 3, 4, 5, and 6.

The Results of Implementation

The complete program was presented to production supervisors and the plant's middle management after the model was validated, and on the basis of positive feedback, it was decided to conduct a trial implementation. The results were:

- The model can reduce labor requirements by up to two operators per shift.
- There is a significant reduction in scheduling time for production supervisors.
- The schedules generated from the model significantly improve the balance of operator utilization.
- Rescheduling due to unexpected changes such as machine breakdown, which was not attempted in the past, can be done to balance operator work load.

There are some issues, not taken into consideration while developing this model, that make the problem more complicated. In any case, the effect on the solution may be negligible. For example, the time required for an operator to walk to attend each machine is ignored, as the walking sequence cannot be easily predicted. Instead of solving this issue as part of the algorithm, it can be approximately taken care of by adding the walking time into the time standard. As stated earlier, the heuristic procedure cannot guarantee optimal solution. However, the solution obtained was adequate for our application, as approximately 92 percent efficiency was obtained.

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